TUROV, S.S.

ARKHANGEL'SKIY, V.V., redaktor; GERMAN, V.Ye., redaktor; DEBRIN, I.I., redaktor; PERMITIN, Ye.N., redaktor; SMIRNOV, N.P., redaktor; TUROV, S.S., redaktor; DOTSENKO, A.A., tekhnicheskiy redaktor

[In the wilds; an almanac] Okhotnich'i prostory; al'manakh. Moskva, Gos. izd-vo "Fizkul'tura i sport." Vol.7. 1957. 332 p. (Hunting) (MIRA 10:8)

TUROV, Sergey Sergeyevich, professor; NAMITOKOVA, Z.A., redaktor; PARSADANOVA, K.G., redaktor izdatel'stva; GAMZAYEVA, M.S., tekhnicheskiy redaktor

[Nature photographer] Naturalist-fotograf. Izd. 2-oe, ispr. i dop. Moskva, Gos.izd-vo "Sovetskaia nauka," 1957. 198 p.
(Nature photography) (MLRA 10:7)

TUROV, V.

Great achievements of the Dokshukine elevator. Muk.-elev. prom. 24
Muk.-elev. prom. 24 no.12:27-28 D '58. (MIRA 12:1)

1.Starshiy bukhgalter Dikshukinskogo elevatora Kabardino-Balkarskoy ASSR.
(Dokshukino (Kabardia)--Grain elevators)

TUROV, V., starshiy bukhgalter

How we store seed corn. Muk.-elev.prom. 26 no.5:30 My '60.
(MIRA 14:3)

1. Dokshukinskiy elevator Kabardino-Balkarskoy ASSR.
(Corn(Maize)--Storage)

APPROVED FOR RELEASE: 04/03/2001 CIA-RDP86-00513R001757610002-2"

TUROV, V.

The organ of collective leadership. Sov.profsoiuzy 6 no.13:
31-35 O '58. (MIRA 11:11)
(Mytishchi--Machinery industry)

TUROV, V. (Arsk, Tatarskaya ASSR)

Volunteer workers assisting a district committee. Sov. profsoiuzy 17 no.23:24-25 D '61. (MIRA 14:12)
(Arsk District—Trade unions)
(Arsk District—Education)

APPROVED FOR RELEASE: 04/03/2001 CIA-RDP86-00513R001757610002-2"

TUROV, V. (g. Saratov)

It is a paper screen... Sov.profsoiuzy 18 no.22:21-22 N '62.
(MIRA 15:12)

(Saratov Province—Insurance, Social)
(Saratov Province—Trade unions)

TUROV, V. (Voronezh)

From the practice of the cultural committee. Sov. profsoiuzy 19 no.10:17 My '63. (MIRA 16:7)
(Voronezh--Machinery industry workers--Education and training)
(Trade unions)

L 6762-65

ACCESSION NR: AP4045813 S/0148/64/000/009/0122/0126

AUTHOR: Yelyutin, V. P.; M. A. Maurakh; V. D. Turov

TITLE: Method for measuring the electrical resistance of molten metals

SOURCE: IVUZ. Chernaya metallurgiya, no. 9, 1964, 122-126

TOPIC TAGS: electrical resistance, molten metal electrical resistance, electrical resistance measurement, molten metal

ABSTRACT: The electrical resistance of liquid metals is an important property required for the solution of many problems and many methods have been described for its measurement. ...

Card 1/6

The classical equations of hydrodynamics are used for the calculation of liquid metal flow

$$L \approx 8,46U_0 \sqrt{\frac{\rho a^3}{\sigma}} \quad (1)$$

where L is the length of the solid part of the flow, U_0 is the initial flow velocity, ρ is the density, a is the average radius, and σ is the surface tension. However this equation

where σ = surface tension, $\varnothing$ = velocity coefficient = $\frac{U_0}{\sqrt{2gH}}$, g = acceleration due to gravity, H = height of the liquid metal in the crucible, K_1 = ratio between thickness of

Card 2/6

L 8762-65
ACCESSION NR: AP4045813

crucible floor and diameter of hole in the floor, and K_2 = coefficient depending on surface of the opening. This equation has been verified for metal flow from round openings in a

equations.

ASSOCIATION: Moskovskiy institut stali i splavov (Moscow Steel and Alloy Institute)

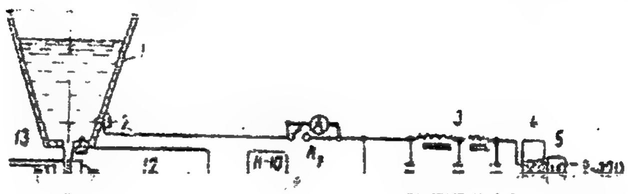
SUBMITTED: 28Jan64 ENCL: 03 SUB CODE: MM

NC REF SOV: 005 OTHER: 006

Card 3/6

L 8762-65
ACCESSION NR: AP4045813 Figure 1 ENCLOSURE: 01

Schematic for the measurement of the electrical resistance of molten metals by the drop flow method:



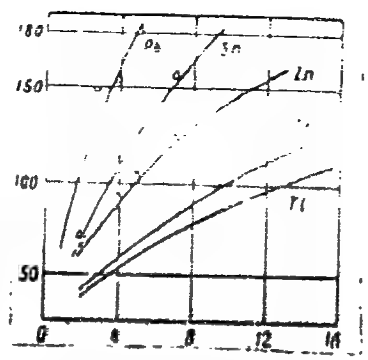
8 - lower current connection;
9 - intake
10 lower contact;
11 shields
12 - upper contact;
13 - heater;
14 - motion picture camera;
15 - color electrical pyrometer

Card 4/6

APPROVED FOR RELEASE: 04/03/2001 CIA-RDP86-00513R001757610002-2"

L 8762-65

ACCESSION NR: AP4046813 Figure 2 ENCLOSURE: 03



Relationship between length of solid part of flow (L) and diameter of discharge opening (d). The conditions of flow were similar ...

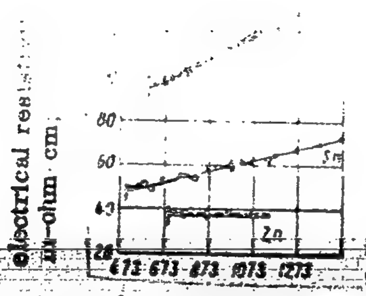
experimentally.

Card 5/5

L 8762-65
ACCESSION NR: AP4045813

Figure 3

ENCLOSURE 03



Temperature dependence of the electrical resistivity of lead, tin and zinc according to data from 0 - present authors; ● - Roll & Motz; ... key & ... X - Korol'kov & ...

YELYUTIN, V.P.; MAURAKH, M.A.; TUROV, V.D.

Method of measuring the electric resistance of molten metals.
Izv. vys. ucheb. zav.; chern. met. 7 no.9:122-126 '64.
(MIRA 17:6)

1. Moskovskiy institut stali i splavov.

YELYUTIN, V.P.; MAURAKH, M.A.; TUROV, V.D.

Apparatus for measuring the electric conductivity of liquid chemically active refractory metals. Zav. lab. 30 no.11: 1401-1403 '64 (MIRA 18:1)

1. Moskovskiy institut stali i splavov.

ZATOPLYAYEV, V.A.; TUROV, V.D.; ARSEN'YEV, V.V.

Preparation of unclassified coal: Jigging unclassified coal at the "Verkhne-Duvanskaya" Central Preparation Plant. Ugol' 39 no 6:17-19 Je'64 (MIRA 17:7)

1. Verkhne-Duvanskaya tsentral'naya obogatitel'naya fabrika (for Zatoplyayev, Turov). 2. Gipromashugleobogashcheniye (for Arsen'yev).

Pt-10/Pu-4 JD/WW/JG

ACCESSION NR: ... /65/000/001/0112/0114

AUTHOR: Yelyutin, V.P.; Turov, V.D.; Maurakh, M.A

TITLE: Changes in ... metals when melted

SOURCE: IVUZ. Chernaya metallurgiya, no. 1, 1965. 112-114

TOPIC TAGS: ... transition metals, 3d electron shell metal conductivity

... of molten transition metals ...

Card 1/2

L 31099-65

ACCESSION NR: AP5003502

V, Cr, Mn, K, Ca and Sc have

SUBMITTED:

NO REF SOV: 004 OTHER: 002

YELYUTIN, V.P.; MAURAKH, M.A.; TUROV, V.D.

Viscosity and electric conductivity of liquid alloys of zirconium with aluminum, silicon and niobium. Izv. vys. ucheb. zav.; chern. met. 8 no.11:110-116 '65. (MIRA 18:11)

1. Moskovskiy institut stali i splavov.

MGALOBLISHVILI, Nodar Mikhaylovich. Prinimali uchastiye: TUROV, V.M., inzh.-sant.tekhn.; BARTNIKAYTIS, V.A., inzh.-elektrik; BAULIN, V.A., red.; EL'KINA, E.M., tekhn. red.

[New types of central kitchens for public food-serving establishments; design and planning] Novye tipy zagotovochnykh predpriiatii obshchestvennogo pitaniia; voprosy proektirovaniia. Moskva, Gos. izd-vo torg. lit-ry, 1961. 140 p. (MIRA 15:1)
(Restaurants, lunchrooms, etc.)

BASIN, G.L.; kand. tekhn. nauk; TUROV, V.M., inzh.

Ventilating an experimentally mechanized potato cellar for potato storage in bulk. Vod. i san. tekh. no.7:23-27 Jl '64 (MIRA 18:1)

APPROVED FOR RELEASE: 04/03/2001 CIA-RDP86-00513R001757610002-2"

RAYRMAN, N.S., kand.tekhn.nauk, dotsent; TUROVA, V.M., inzh.; VASIL'YEVA, R.S., inzh.

Using correlation methods in calculating basic dimensions for bearing ring billets. Vest.mashinostr. 44 no. 2:35-39 F '64. (MIRA 17:7)

TUROV, V.P.

7

S/016/62/000/007/001/002
D037/D113

AUTHORS: Aleksandrov, N.I., Gefen, N.Ye., Gapochko, K.G., Garin, N.S., Koridze, G.G., Markozashvili, I.N., Osipov, N.P., Pischik, I.P., Posobilo, I.A., Smirnov, M.S. and Turov, V.P.

TITLE: Aerosol immunization with dry dust vaccines and anatoxins. A study of the method of aerosol immunization with dust plague vaccines during mass immunization.

PERIODICAL: Zhurnal mikrobiologii, epidemiologii i immunobiologii, no. 7, 1962, 46-50

TEXT: Tests were conducted to approve the practical use of mass aerosol immunization with plague vaccine and to check and specify previously obtained data which testified that this vaccination method was safe and had a low reactivity. Dust plague vaccine was used in a dose of 150-200 million living microbes of the vaccine EB strain. Four 15-min. seances took place with up to 190 persons at a time in a 112 m^3 room. On the days following vaccination, 157 persons were subjected to X-ray and hematological tests.

Card 1/2

7

S/016/62/000/007/001/002
Aerosol immunization with dry dust vaccines... D037/D113

It was found that the reactivity of this method is much lower than that of the subcutaneous and cutaneous immunization methods. Conclusions: (1) Aerosol immunization with dust plague vaccine, using the above-mentioned dose, provoked no distinct reaction but caused characteristic changes in the peripheral blood. (2) This method, tested under practical conditions on 545 persons, is very simple and allows the population to be mass-immunized against plague within a short time. There is 1 table.

SUBMITTED: August 8, 1961

Card 2/2

ALEKSANDROV, N.I.; GEFEN, N.Ye.; GAPOCHKO, K.G.; GARIN, N.S.; KORIDZE, G.G.; MARKOZASHVILI, I.N.; OSIPOV, N.P.; PISCHIK, M.P.; POSOBILO, I.A.; SMIRNOV, M.S.; TUROV, V.P.

Aerosol immunization with dry pulverized anatoxins and vaccines. Report No.8: Studies on a method of aerosol immunization with pulverized antiplague vaccine of large numbers of persons. Zhur. mikrobiol., epid. i immun. 33 no.7:46-50 Jl '62. (MIRA 17:1)

TUROV, E.A.

1433 AERE-Lib/Trans-547
ON THE EXCHANGE INTERACTION OF VALENCY AND INNER ELECTRONS IN CRYSTALS (THE (s—d) EXCHANGE MODEL OF THE TRANSITION METALS). S. V. Vonsovskii and E. A. Turov. Translated by J. B. Sykes from Zhur. Eksptl'. i Teoret. Fiz. 24, 419-28(1953). 12p.

On the basis of a multi-electron theory of transition metals, the (s—d) exchange model is constructed; this takes account of the active participation, in the physico-chemical properties of crystals of transition group elements, of former valency and inner electrons from incomplete layers of the envelopes of the isolated atoms of these elements. An expression is obtained for the energy operator of the system in the second quantization representation. The eigenvalues of this operator give two branches of the energy spectrum of the system, corresponding to elementary excitations of the Bose type (ferromagnons) and of the Fermi type (conduction electrons). A nondiagonal addition to the energy operator describes the processes of interaction (collisions) between the ferromagnons and the conduction elements. (auth)

(1)

APPROVED FOR RELEASE: 04/03/2001 CIA-RDP86-00513R001757610002-2

TUROV, Ye. A.

"Quantum Theory of Kinetic Processes in Ferromagnetic Metals." Cand Phys-Math Sci, Khar'kov State U imeni A. M. Gor'kiy, Min Higher Education USSR, Khar'kov, 1954. (KL, No 5, Jan 55)

Survey of Scientific and Technical Dissertations Defended at USSR Higher Educational Institutions (12)

SO: Sum. No. 556, 24 Jun 55

TUROV, E.A.

USSR/Physics - Ferro magnets

Card 1/1 : Pub. 22 - 16/44

Authors : Turov, E. A.

Title : Calculation of magnetic interaction in the s-d exchangeable model of ferro-magnetic metal

Periodical : Dok. AN SSSR 98/6, 945-948, October 21, 1954

Abstract : An analytical study of the peculiarities in the magnetic and electric properties of elementary ferro magnets is presented. The study was conducted with the help of the so-called s-d exchangeable model of transient metals. In accordance with the basic assumption for such models the 3d-electrons (electrons of ferromagnetism) were expressed through "atomic" orthonormalized functions $\varphi(r-n)$ and the 4s-electrons (electrons of conductivity) through non-localized wave functions of the single electron theory of metals, i.e., $\psi_k(r) = \frac{1}{\sqrt{N}} e^{ikr} u_k(r)$

This study enables the anisotropic character of electric resistance in ferro magnets to be understood. Three references; 2 U.S.S.R., 1 U.S.A. (1940-1953).

Institution : .....

Presented by: Academician N. N. Bogolyubov, May 29, 1954

TUROV, Ye.A.

Relaxation processes in ferromagnetic metals at low temperatures. Izv. AN SSSR.Ser.fiz. 19 no.4:462-473 Jl-Ag '55. (MLRA 9:1)

1.Institut fiziki metallov Ural'skogo filiala Akademii nauk SSSR. (Ferromagnetism) (Metals at low temperatures)

G-4

TUROV, YE. A

Category : USSR/Electricity - Conductors

Abs Jour : Ref Zhur - Fizika, No 1, 1957 No 1622

Author : Turov, Ye.A.
Inst : Inst. of Metal Physics, Ural Branch of the Acad. Sci. USSR Sverdlovsk
Title : Electric Conductivity of Ferromagnetic Metals at Low Temperatures

Orig Pub : Izv. AN SSSR, ser. fiz., 1955, 19, No 4, 474-480

Abstract : The temperature dependence of the electric resistivity (ρ) of ferromagnetics is calculated at low temperatures. According to the idea first expressed by S.V. Vonsovskiy (Zh. eksperim i teor. fiziki, 1948, 18, 219) electrons in ferromagnetics can exchange energy not only with phonons, but also with ferromagnons.
Using expressions for the interaction probability, derived in another article (Izv. AN SSSR, ser. fiz. 1955, 19, No 4, 462) the author obtains: (a) $\rho \sim T^2$ in the case of an exchange mechanism; (b) $\rho \sim T$ in the case of a spin-orbital interaction.
It is shown that at low temperatures the resistivity caused by the interaction with ferromagnons may exceed considerably the resistivity caused by the interaction with the phonons, and the spin-orbital mechanism may turn out to

Card

Card : 1/2

TUROV, E. A.

The quantum theory of fermmagnetism. S. V. Vonsovskii, K. B. Vlasov, and E. A. Turov. *Zhur. Eksptl. i Teoret. Fiz.* 29, 37-50(1955).—On the basis of a polyelectron quantum-mechanical model of a crystal there is derived the calcn. of the magnetic action of the electrons upon the ferromagnet. The energy spectrum of the system is calcd. for the case of low temps. The computation of the terms of the magnetic action in the original Hamiltonian system leads in the energy to the appearance of components of the magnetic quasiclassical type as well of terms of the type of anisotropic (magnetic) exchange. This latter fact might have some significance for the calcn. of the relaxation phenomena both in ferromagnetic and antiferromagnetic crystals. There is also derived the energy of the system close to the energy centers of gravity, i.e. the case of higher temps. An equation is obtained for the free energy as a function of the magnitude of the magnetizability and its orientation in the crystal (the energy of the magnetic anisotropy) for temps. which are close to the Curie point. Werner Jacobson 62

2

TUROV, E. A. (Sverdlovsk)

"On Spectrum of the Elementary Excistations and Some Kinetic Processes in Ferromagnetic Crystals," a paper submitted at the International Conferene on Physics of Magnetic Phenomena, Sverdlovsk, 23-31 May 56.

TIREV, E.A.

VONSOVSKIY, S.V.; IRKHIN, Yu.P.; KUSHNIRENKO, A.N.; TUROV, Ye.A.

Multielectron theory of semiconductors. Part 1. Fiz.met. i metalloved.3 no.3:385-394 '56. (MIRA 10:3)

1. Institut fiziki metallov Ural'skogo filiala AN SSSR.
(Electrons) (Semiconductors)

Turov, E.A.

101

AUTHOR: Irkhin, Yu. P. and Turov, E. A.

TITLE: On the multi-electron theory of semi-conductors. Part II. Ferro-magnetic semi-conductors. (K mnogoelektronnoy teorii poluprovodnikov. II. Ferromagnitnye poluprovodniki).

PERIODICAL: "Fizika Metallov i Metallovedenie", (Physics of Metals and Metallurgy), 1957, Vol. IV, No.1. (10), pp.9 - 13 (U.S.S.R.)

ABSTRACT: The multi-electron model of a semi-conductor proposed in an earlier paper (1) is generalised for the case of ferro-magnetic crystals. In accordance with this model spin excitations (ferro-magnons) are successively separated in addition to charging excitations (Fermi and Bose excitons). On approaching the energy centre of gravity the activation energy for ferro-magnetic electrons and the effective mass of the excitons is dependent on the spontaneous magnetisation of the crystal and this enables the explanation of the discontinuity in the curve $\ln\sigma(1/T)$ at the Curie point for some ferrites. A simplified electron structure of a ferro-magnetic semi-conductor is considered, corresponding to an idealized multi-electron model in which the magnetic and the electric properties of the crystal can be described as being inter-related properties of a single system of a number of interacting electrons. It is assumed that in the basic state of the crystal each node will have in addition to two "external" valency electrons, which form a closed spin shell (s-shell), one

"internal" electron with a non-compensated spin corresponding to the vacant d-shell of the isolated atom. In the lowest energy state the spins of all the "internal" electrons of the crystal will be mutually parallel. Transition of the s-electron into the excited state, the p-state, of the given or of another node, and also the transformation of the spin d-electron will be the elementary excitations of the system (excitons and ferro-magnons). Sub-dividing the electron system into an internal and external one it is assumed that the first one determines fundamentally the magnetic properties and the second one the electric properties of the crystal; interaction between the two determines the relation between these properties (2). The authors investigated the energy spectrum for the two limiting cases, namely, for the low temperature range, applying the method of quasi-particles and, for the temperature range approaching the Curie point, where it is possible to limit the work of determining the mean energy relative to the states of the d-electrons with given values of spontaneous magnetisation. There are six references, five of which are Russian.

Metal Physics Institute, Ural Branch, Ac.Sc. Recd.October 2, 1956.

127

AUTHOR: Turov, Ye. A.

TITLE: On the theory of g-factor in ferro-magnetic metals. (K teorii g-faktora v ferromagnitnykh metallakh.)

PERIODICAL: "Fizika Metallov i Metallovedenie" (Physics of Metals and Metallurgy) 1957, Vol.IV, No.1 (10), pp.183-184 (U.S.S.R.)

ABSTRACT: The author points out in conjunction with the work published by Kittel and Mitchell (Phys. Rev.,1956, 101, 1611) that the existence of an H_i field follows directly from the s-d- exchange model of a ferro-magnetic metal. The magnitude of this field was calculated by the author of this paper for a different problem in earlier work (3). The fact deduced from eq.(4) of this paper that at the Curie point H_i ceases is in agreement with the results of Bagguley (5) who observed a jump in the g-factor in colloidal nickel during transition through the Curie point. The author believes that it is of interest to generalise the results for the case of binary ferro-magnetic alloys. 6 references, of which 4 are Russian.

Institute of Metal Physics,
Ural Branch of the Ac.Sc.

Recd. August 22, 1956.

TUROV, YE A

48-6-20/23

SUBJECT: USSR/Physics of Magnetic Phenomena

AUTHOR: TUROV, Ye.A.

TITLE: On the Spectrum of Elementary Excitations and Some Kinetic Processes in Ferromagnetic Crystals (O spektre elementarnykh vozbuzhdeniy i nekotorykh kineticheskikh protsessakh v ferromagnitnykh kristallakh)

PERIODICAL: Izvestiya Akademii Nauk SSSR, Seriya Fizicheskaya, 1957, Vol 21, #6, p 887 (USSR)

ABSTRACT: The report deals with a theoretical investigation of the energetic spectrum of ferromagnetic metals and semiconductors, which takes into consideration interconnection between the magnetic (spin), current (charge) and lattice (phonon) degrees of freedom of a system.

Some kinetic phenomena in ferromagnetic crystals, such as electroconductivity, ferromagnetic resonance, etc., are discussed in applications of the theory.

The detailed content of this report was published in the articles:

Card 1/2

48-6-20/23

TITLE: On the Spectrum of Elementary Excitations and Some Kinetic Processes in Ferromagnetic Crystals (O spektre elementarnykh vozbuzhdeniy i nekotorykh kineticheskikh protsessakh v ferromagnitnykh kristallakh)

ФMM, 1956, Vol 3, p 15 and Izvestiya AN SSSR, Seriya Fizicheskaya, 1955, Vol 19, p 463, and p 474.

No references are cited.

ASSOCIATION: Not indicated.

PRESENTED BY:

SUBMITTED: No date indicated

AVAILABLE: At the Library of Congress.

Card 2/2

Turov, Ye. A.

PHASE I BOOK EXPLOITATION SOV/3847
SOV/26-M-20

Akademiya nauk SSSR. Ural'skiy filial. Institut fiziki metallov

Trudy, vyp. 20 (Transactions of the Institute of the Physics of Metals, Ural Branch, Academy of Sciences USSR, No. 20) Sverdlovsk, 1958. 402 p. Errata slip inserted. 1,000 copies printed.

Resp. Eds.: S.V Vonsovskiy, Corresponding Member, Academy of Sciences USSR, and V I. Arkharov, Doctor of Technical Sciences.

PURPOSE: This book is intended for scientists working in the field of physical metallurgy.

COVERAGE: This is a collection of 28 articles written by members of the Institute of the Physics of Metals, Ural Branch of the Academy of Sciences USSR, on problems investigated at the Institute. Studies at the Institute have concentrated on two basic problems: 1) developing a theory of metals and alloys and finding ways to improve the properties of engineering materials; and 2) developing new physical methods for investigating and controlling the quality of materials and metal articles. In connection with these basic problems the articles in the collection treat the following subjects: problems of the multielectron quantum-mechanical theory of solids; the laws of distribution and diffusion of admixtures in various metallic alloys (internal adsorption theory); strength and plasticity of polycrystalline materials in relation to interatomic binding forces, distortions in the crystal lattice; structural theory of diffusion reaction, i.e. diffusion due to chemical reactions in solid phases; theory of the magnetic structure of ferromagnetic substances; theory of the heat treatment of steel; and the physical theory of magnetic measurements (magnetic flaw detection and structural analysis). The first article gives a description of the work being done by the Institute and a list of departments and laboratories along with their chief personnel. Several persons are cited for their work at the Institute. References accompany each article.

TABLE OF CONTENTS:

Card 3/6

5

Ye. A. Turov

24(0) SOV/53-67-4-7/7

AUTHOR: Chentsov, R.

TITLE: The Fifth All-Union Conference on the Physics of Low Temperatures (5-ye Vsesoyuznoye soveshchaniye po fizike nizkikh temperatur) 1958

PERIODICAL: Uspekhi fizicheskikh nauk, 1959, Vol 67, Nr 4, pp 743-750 (USSR)

ABSTRACT: This Conference took place from October 27 to November 1 at Tbilisi; it was organized by the Otdeleniye fiziko-matematicheskikh nauk Akademii nauk SSSR (Department of Physico-mathematical Sciences of the Academy of Sciences, USSR), the Akademiya nauk Gruzinskoy SSR (Academy of Sciences, Gruzinskaya SSR), and the Tbilisskiy gosudarstvennyy universitet im. Stalina (Tbilisi State University imeni Stalin). The Conference was attended by about 300 specialists from Tbilisi, Moscow, Khar'kov, Kiyev, Leningrad, Sverdlovsk, and other cities as well as by a number of young Chinese scientists at present working in the USSR. About 50 lectures were delivered which were divided according to research fields.

. . . . IV. Magnetism. A. S. Borovik-Romanov (IFP) delivered a report on investigations he carried out of the anisotropy of the weak ferromagnetism in monocrystal samples of the antiferromagnetic $MnCO_3$ (the effect of anisotropy was predicted by the thermodynamical theory developed by Dzyaloshinskiy). In the course of the discussion R. A. Alikhanov (IFP) spoke about neutronographical investigations he carried out of the magnetic structure of $MnCO_3$ and $FeCO_3$ at low temperatures. P. L. Kapitsa stressed the importance of the method based upon Dzyaloshinskiy's theory. V. K. Kreynes (VNIIFTRI), whose lecture was read by A. S. Borovik-Romanov, reported on measurements carried out by him (in the IFP) of the magnetic anisotropy of the antiferromagnetic $CuSO_4$- and $CoSO_4$-monocrystals.

Card 7/11

Ye. A. Turov (IFM AN SSSR, Sverdlovsk) spoke about his theoretical investigations of the magnetizability, the susceptibility, the specific heat, and the resonance frequencies of antiferromagnetics and weak ferromagnetics. A. I. Sudovtsev and Ye. Ye. Semenenko (KhFTI) spoke about measurements of the electric resistance of iron in magnetic fields in a wide temperature range with simultaneous plotting of the magnetization curve. N. V. Vol'kenshteyn, G. V. Fedorov, E. V. Galoshina and M. I. Turchinskaya (IFM AN SSSR) spoke about measurements of magnetization and the Hall effect of polycrystalline samples, nickel and Ni_3Mn at low temperatures. Ye. I. Kondorskiy, V. Rode, U. Gofman and Chang Shou-ch'un (MGU) gave a report on susceptibility measurements on nickel and its alloys with copper at low temperatures; T. I. Sanadze (TGU) spoke about the spectrum of the paramagnetic resonance of Tb^{3+} in terbium nitrate at temperatures of liquid hydrogen. M. I. Kaganov and V. M. Tsukernik (KhFTI) dealt with the kinetic phenomena in ferromagnetics at low temperatures and with calculation of relaxation time; A. I. Akhiyezer, V. Bar'yakhtar and S. Peletminskiy (KhFTI) carried out a theoretical investigation of the relaxation of the magnetic moment in ferrodielectrics; Vlasov (IFM AN SSSR) showed that a linearly polarized elastic (ultrasonic) wave of a frequency of 10^9 cycles when passing through a ferromagnetic substance in the direction of the magnetic field, is subjected to a turn of the polarization plane of the order of 10^{-3} - 10^{-4} radian/cm oersted. M. I. Kaganov pointed out that in this connection yet another phenomenon may be observed, namely the resonance absorption of ultrasonics if the wavelength is equal to the radius of the Larmor orbit of the electron. . V. Various Questions. One of the most interesting lect.

Card 8/11

SOV/30-59-2-42/60

24(0)

AUTHOR: Khalatnikov, I. M., Doctor of Physical and Mathematical Sciences

TITLE: Investigations of Low-temperature Physics (Issledovaniya po fizike nizkikh temperatur)

PERIODICAL: Vestnik Akademii nauk SSSR, 1959, Nr 2, pp 98-100 (USSR)

Tu-R-ov, Ye. A.

ABSTRACT: The 5th All-Union Conference on this problem took place in Tbilisi from October 27 to November 1, 1958. It was attended by physicists from Moscow, Khar'kov, Leningrad, Tbilisi, Sverdlovsk, and Kiyev. 4 fields of low-temperature physics were discussed: superfluidity of liquid helium II, supraconductivity, antiferromagnetism, magneto-resistive effect. The following reports and communications were heard: A. A. Abrikosov, L. P. Gor'kov reported on the investigation of the properties of supraconductive alloys. A. A. Abrikosov, L. P. Gor'kov, I. M. Khalatnikov spoke of properties of supraconductors in the high-frequency magnetic field. D. V. Shirkov and Chen' Chun'-syan' and Chzhou Si-shin', two young Chinese scientists working at Moscow University, described investigations for determination of the influence exercised by the Coulomb (Kulon) interaction of charges on supraconductivity. V. V. Tolmachev explained the

Card 1/4

nature of the so-called collective excitations of the Bose type in supraconductors. D. N. Zubarev, Yu. A. Tserkovnikov spoke of the thermodynamics of supraconductors and B. T. Geylikman, V. Z. Kresin of the thermal conduction of supraconductors. Yu. V. Sharvin, V. P. Gantmakher reported on experimental work with supraconductors. N. V. Zavaritskiy spoke of the measurement of the anisotropy of thermal conductivity in the supraconductive state. In a series of reports problems of the superliquidity of helium were discussed, which was discovered in 1938 by P. L. Kapitsa and the theory of which was set up in 1941 by L. D. Landau. E. L. Andronikashvili and his collaborators investigated the properties of rotating helium. V. P. Peshkov spoke of the effect of the formation of the boundary between superliquid and non superliquid helium. Guan Vey-yan', collaborator of the Institut fizicheskikh problem (Institute of Physical Problems) investigated the properties of the so-called jump in temperature of Kapitsa. I. M. Lifshits, V. G. Peschanskiy investigated galvanomagnetic phenomena in strong magnetic fields for metals with open Fermi surfaces. N. Ye. Alekseyevskiy, Yu. P. Gaydukov experimentally investigated the resistance anisotropy of gold monocrystals in the magnetic field. L. S. Kan, B. G. Lazarev combine the presence of a temperature minimum with the structural state of the metal. M. Ya. Azbel' reported on the quantum theory of metallic conductivity in the alternating electromagnetic and constant magnetic field. A. S. Borovik-Romanov reported on the weak ferromagnetism in antiferromagnetic samples of $MnCO_3$. N. M. Kreynes,

Card 2/4

Ye. A. Turov investigated the magnetic anisotropy of the antiferromagnetic monocrystals $CuSO_4$ and $CoSO_4$. A. A. Alikhanov reported on neutronographic investigations of antiferromagnetics. Ye. I. Kondorskiy and collaborators reported on the susceptibility of nickel and nickel-copper alloys at low temperatures. M. I. Kaganov, V. M. Tsukernik reported on kinetic phenomena in ferromagnetics at low temperatures. A. I. Akhiyezer, V. G. Bar'yakhtar, and S. P. Peletminskiy spoke of computations of the relaxation of the magnetic moment in ferromagnetic dielectrics at low temperatures. T. I. Sanadze spoke of observation results of paramagnetic resonance of terbium in the $TbNO_3 \cdot 6H_2O$ nitrate. G. R. Khutsishvili gave a theoretical analysis of the orientation of the nuclear spin in the Overhauser (Overkhauzer) effect in nonmetals. B. N. Samoylov, N. M. Reynov and collaborators reported on obtaining orientated nuclei. N. V. Bulatova, V. S. Kogan and B. G. Lazarev showed that hydrogen isotopes in solid state have different structures. I. A. Gindin, B. G. Lazarev, Kh. D. Starodubov and V. I. Khotkevich detected polymorphism in a number of metals at low temperatures. E. L. Andronikashvili, V. P. Peshkov and M. P. Malkov reported on the stage of development of foreign scientific research work in the field of low-temperature physics. At the end of the Conference P. L. Kapitsa spoke of his successful development of investigations in the field of low-temperature physics. The participants of the Conference visited the Institut fiziki Akademii nauk Gruzinskoy SSR (Physics Institute of the Academy of Sciences of the Gruzinskaya SSR) and the Physics Faculty of Tbilisi University as well as the building of the new research atomic reactor near Tbilisi.

Card 3/4

TUROV, Ye. A.; and VONSOVSKIY, S. V. (Dr.)

"Phenomenological Treatment in the Quantum Theory of Ferro- and Antiferro-magnetism,"

paper presented at the Fourth Annual Conference on Magnetism and Magnetic Materials
Philadelphia, Pa., 17-20 Nov. 1958.

SOV/109-3-11-13/13

AUTHORS: Monosov, Ya.A. and Turov, Ye.A.

TITLE: Seminar on Ferromagnetic Resonance (Seminar po ferromagnitnomu rezonansu)

PERIODICAL: Radiotekhnika i Elektronika, 1958, Vol 3, Nr 11, p 1407 (USSR)

ABSTRACT: Between February 8 - 13, 1958, a seminar on ferromagnetic resonance was held at the Institut fiziki metallov (Institute of the Physics of Metals) in Sverdlovsk. The seminar was attended by physicists and scientists from Sverdlovsk, Moscow, Leningrad, Khar'kov and Perm. A number of works were read and discussed. These dealt with the following problems of the ferromagnetic resonance:

1) The theory of spin waves and various types of magnetisation oscillations in ferromagnetics.
2) Relaxation processes and the width of the line of the ferromagnetic resonant absorption.
3) Properties of the ferromagnetic resonance in metals.
4) Thermo-dynamic theory of the ferromagnetic resonance and the effect of magnetic crystallo-graphic anisotropy.
5) Non-linear effects in ferrites during the ferromagnetic resonance and the prospects of their applications.

Card1/2

SOV/126-6-2-2/34

AUTHOR: Turov, Ye. A.

TITLE: Electrical Conductivity of Ferromagnetic Metals at Low Temperatures. II (Elektroprovodnost' ferromagnitnykh metallov pri nizkikh temperaturakh. II)

PERIODICAL: Fizika Metallov i Metallovedeniye, 1958, Vol 6, Nr 2, pp 203-213 (USSR)

ABSTRACT: The first part of this work may be found in Izv.AN SSSR, ser. fiz., Vol 19, p 474 (1955). In the present paper a phenomenological study is made of the interaction between conduction electrons and "ferromagnons". The problem of electrical resistance of ferromagnetics in the low temperature region is considered in greater detail than was done in Part I, taking into account the new experimental data reported by Sudovtsev et al, (Ref.2). It was shown in Part I (Ref.1) that the electrical conductivity ρ depends on temperature in the following way:

$$\rho_T = a_1 T + a_2 T^2 \qquad (1)$$

where a_1 and a_2 are constants independent of temperature. Recent experimental data (Refs. 2 and 3) indicate that the

Card 1/5

SOV/126-6-2-2/34

Electrical Conductivity of Ferromagnetic Metals at Low Temperatures. II

electrical conductivity of iron and nickel at liquid helium temperatures is well represented by a formula of the form:

$$\rho = \rho_0 + \rho_T \qquad (2)$$

where ρ_T is given by the expression above. For platinum the corresponding relation is

$$\rho_T = a_2 T^2 \qquad (3)$$

In Part I (Ref.1) the electrical conductivity of ferromagnetics was calculated using the s-d exchange model of Vonsovskiy (Ref.5). In view of the appearance of new experimental data which are in good agreement with the results of Ref.1, the author has carried out a more detailed quantitative study of the above problem through the solution of the kinetic equation. A phenomenological study has also been made of the interaction between

Card 2/5

SOV/126-6-2-2/34

Electrical Conductivity of Ferromagnetic Metals at Low Temperatures. II

conduction electrons and "ferromagnons". The energy operator for the interaction between conduction electrons and ferromagnons is given by Eq.(15). The square of the modulus of the transition matrix elements for processes of the type $\Delta m = \pm 1$ is shown to be

$$w(\vec{q}) = \frac{64\pi^2 g\beta^3 M_o}{3V} \cdot \frac{k^2}{q^2} \sin^2\vartheta$$

where g is Lande's factor, $\beta = \frac{eh}{2mc}$, M_o is the z component of magnetisation where the magnetisation M is taken to be of the form

$$\begin{aligned} M_{xq} &= M^o_{xq} e^{i(\vec{q}\,\vec{r} + \omega t)}, \\ M_{yq} &= M^o_{yq} e^{i(\vec{q}\,\vec{r} + \omega t)}, \\ M_z &\simeq M_o = \text{const.} \end{aligned} \tag{4}$$

Card 3/5

SOV/126-6-2-2/34

Electrical Conductivity of Ferromagnetic Metals at Low Temperatures. II

k is a wave involved in the coordinate part of the wave function (assumed to be in the form of a plane wave) and ϑ is the angle between $\vec{k}$ and $\vec{q}$. The final expression for the conductivity ρ obtained by solving the kinetic equation is

$$\rho = \frac{4\pi h(\beta M_o)^2 k_o \chi T}{3e^2 n(dE/dk)_o^2 A} \left(1 + \ln \frac{\chi T}{g\beta H'}\right), \tag{39}$$

where n is the number of conduction electrons per cc, χ is a function which determines the distribution of phase points on the Fermi surface, T is the temperature, H' is the effective magnetic field, E is the energy of conduction electrons and A is the exchange interaction constant which is determined experimentally from the law $M = M_o(1-CT^{3/2})$. The expression for ρ is then re-written in the form

$$\rho = \frac{4h(\beta M_o)^2 B^2}{\pi e^2 A \chi} T \left(1 + \ln \frac{\chi T}{g\beta H'}\right) \tag{42}$$

Card 4/5

SOV/126-6-2-2/34

Electrical Conductivity of Ferromagnetic Metals at Low Temperatures. II

where in the case of results of Ref. 2, $M_0 \sim 10^3$ gauss, $A \sim 10^{-6}$ erg/cm (Ref.15) and $B \sim 10^{-3}$ deg^{-1}.

It follows that $\rho \sim 10^{-26}$ T or $(\rho / \rho\, 0^oC) \sim 10^{-9}$ T.

This is smaller by a factor of 1000 than is required by the results given in Ref.2. It is concluded that the mechanism considered in the present paper, which involves scattering processes of the type $\Delta m = \pm 1$ (of conduction electrons on "ferromagnons"), is only in qualitative agreement with experiment (Ref.2).

There are 18 references, 14 of which are Soviet and 4 English.

ASSOCIATION: Institut fiziki metallov Ural'skogo filiala AN SSSR (Institute of Metal Physics, Ural Branch, Ac.Sc. USSR)

SUBMITTED: January 8, 1957

Card 5/5

1. Ferromagnetic materials--Electrical factors
2. Ferromagnetic materials--Temperature effects
3. Mathematics--Applications

80305
SOV/81-59-7-22403

24.7900
24.2200

Translation from: Referativnyy zhurnal. Khimiya, 1959, Nr 7, p 46 (USSR)

AUTHORS: Turov, Ye.A., Shavrov, V.G.

TITLE: A Phenomenological Theory of Ferromagnetic Phenomena

PERIODICAL: Tr. In-ta fiz. metallov. Ural'skiy fil. AS USSR, 1958, Nr 20, pp 101 - 109

ABSTRACT: The foundations of the mathematic method of a phenomenological theory of ferromagnetic phenomena were laid down. The essence of this theory consists in the viewpoint that a solid body (crystal) is considered not as a discrete but as a compact medium which is characterized by the densities of certain physical quantities (magnetic moment, electrical polarization, impulse, etc.). For finding the energy spectrum of such a medium the expression of the energy is presented in the form of an expansion by the simplest invariants composed of planes with allowance made for the symmetry of the crystal lattice. Moreover, considering that constant density values correspond to the principal state of the system, the Hamiltonian can be expanded into a series by the powers of the

Card 1/2

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80305
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A Phenomenological Theory of Ferromagnetic Phenomena

weak oscillations around these constant values. Then the Hamiltonian obtained for weak oscillations of the interacting classical fields is quantized according to certain rules, and the main part is singled out from it. This part is the energy spectrum of the system in the form of a sum of the energies of the individual quasi-particles and a small addition describing the interaction between these quasi-particles. It is evident that the whole theory is applicable, in such a formulation, only to those cases, when real motions actually represent weak oscillations around a ground "zero" state (e.g., in the case of the consideration of magnetic phenomena at low temperatures). Although in the theory considered, as in any phenomenological theory, several undetermined constants appear in the final conclusions, which must be determined by experiment or from concrete model notions, it nevertheless makes it possible to obtain a series of general informations on the energy spectrum and the properties of solid bodies at a minimum number of model assumptions.

A. Pakhomov

Card 2/2

AUTHORS: Turov, Ye. A., Irkhin, Yu. P. SOV/48-22-10-2/23

TITLE: Phenomenological Theory of Ferromagnetism and Antiferromagnetism in the Range of Low Temperatures (Uniaxial Case). (Fenomenologicheskaya teoriya ferromagnetizma i antiferromagnetizma v oblasti nizkikh temperatur (Odnoosnyy sluchay))

PERIODICAL: Izvestiya Akademii nauk SSSR. Seriya fizicheskaya, 1958, Vol 22, Nr 10, pp 1168 - 1176

ABSTRACT: A magnet which from the macroscopical point of view exhibits an ordered magnetic structure may be regarded as a continuous body showing the symmetry of a certain class of magnetic crystals (Ref 1), while every point is characterized by one, two, or several densities of the magnetic moment $\vec{M}_i(r)^*$. In the present paper the authors investigated the spectrum of the eigen oscillations of $\vec{M}_i(\vec{r})$ of a magnetic medium which is placed into a constant external magnetic field $\vec{H}$. In correspondence with the paper mentioned in reference 2 they started from the phenomenological Hamiltonian for the case of crystals exhibiting uniaxial symmetry. The energy spectrum can be computed in two ways:

Card 1/2

Phenomenological Theory of Ferromagnetism and Antiferromagnetism in the Range of Low Temperatures (Uniaxial Case)

SOV/48-22-10-2/23

In the classic way (Ref 3) or according to the method of secondary quantization (Ref 2). In the present paper the latter one was applied. The application of this method is illustrated in two sample problems. There are 10 references, 5 of which are Soviet.

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of Metal Physics, AS USSR)

AUTHOR: Turov, Ye.A. 56-34-4-39/60

TITLE: The Anisotropy of Magnetic Susceptibility and the Dependence of Specific Heat on the Direction of the Field in an Antiferromagneticum (Anizotropiya magnitnoy vospriimchivosti i zavisimost' teployemkosti ot napravleniya polya v antiferromagnetike)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1958, Vol. 34, Nr 4, pp. 1009-1011 (USSR)

ABSTRACT: The energy spectrum of the spin waves of a uniaxial antiferromagneticum in a magnetic field H (which does not exceed a certain threshold H_0) is known to be highly anisotropic. The formulae for $\vec{H} \parallel Z$ and $\vec{H} \perp Z$ are explicitly written down. In these two cases the ground states of the antiferromagneticum differ essentially. Until recently the spectrum of the spin waves for the case $\vec{H} \parallel Z$ and $H > H_0$ have not been calculated. Such a calculation was carried out by Ye.A.Turov an Yu.P.Irkhin (Ref 4). According to these calculations the difference in the shape of the spectrum existing with respect to the cases $\vec{H} \parallel Z$ and $\vec{H} \perp Z$ continues to exist also after the direction of the antiferromagnetism Δ changes to a direction that is vertical to the field $\vec{H}$. The present paper deals

Card 1/3

The Anisotropy of Magnetic Susceptibility and the Dependence of Specific Heat on the Direction of the Field in an Antiferromagneticum

56-34-4-39/60

with a number of new conclusions determined and drawn by the author when calculating the temperature dependence of the susceptibility χ and the specific heat of the spin waves. Results are given here only for such limiting cases in which the effects which are of interest in this connection can be observed with the greatest distinctness. The formulae given make it possible to give an explanation in principle of the anisotropy of the temperature dependence of the susceptibility discovered by J. Van den Handel et al. (Ref 7) for field strengths near the threshold H_0. The results for C are here given only for the case $\kappa T \ll \mu H_0$, for which the specific heat caused by spin may depend to a considerable extent on the field strength and the direction of the field. From the examples mentioned the following may be gathered: In a uniaxial monocrystal, it is possible, both by changing the magnetic field strength $\vec{H}$ and also by changing the direction of the crystal axis with respect to the unchanged field, to effect a considerable change of the amount of specific heat due to spin and of the form of its temperature dependence. The latter means

Card 2/3

The Anisotropy of Magnetic Susceptibility and the Dependence of Specific Heat on the Direction of the Field in an Antiferromagneticum

56-34-4-39/60

that if the specific heat caused by spin represents a considerable portion of the total specific heat of the antiferromagneticum, a noticeable change of the temperature of the sample must manifest itself in the case of an adiabatic rotation round an axis located in the base plane. There are 7 references, 5 of which are Soviet.

ASSOCIATION: Institut fiziki metallov Ural'skogo filiala Akademii nauk SSSR (Institute of the Physics of Metals of the Ural Branch AS USSR)

SUBMITTED: January 3, 1958

1. Nuclear spins---Temperature factors

Card 3/3

GITERMAN, M.Sh. [Hiterman, M.Sh.]; TUROV, Ye.A. [Turov, IE.A.]

Phenomenological investigation of polar crystals. Ukr.fiz.zhur. 4 no.4:443-450 Jl-Ag '59. (MIRA 13:4)

1. Institut fiziki metallov AN SSSR i Ural'skiy gosudarstvennyy universitet im. Gor'kogo.
(Crystals) (Lattice theory)

24(3)

AUTHOR: Turov, Ye. A. SOV/56-36-4-42/70

TITLE: On the Theory of Weak Ferromagnetism (K teorii slabogo ferromagnetizma)

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1959, Vol 36, Nr 4, pp 1254-1258 (USSR)

ABSTRACT: Borovik-Romanov and Orlova (Ref 1) suggested a model of antiferromagnetism for the purpose of explaining the weak ferromagnetism of $MnCO_3$ and $CoCO_3$; it is assumed that the direction of magnetization of the sublattice is not exactly antiparallel but that it deviates by a small angle. I. Ye. Dzyaloshinskiy (Ref 2) gave a group-theoretical explanation for the possibility of such a state. He showed that the weak magnetism of compounds of the type α-Fe_2O_3 and $MnCO_3$ has properties of magnetics in which the spin of the magnetic ions is in the (111)-planes and the resulting spontaneous-magnetic moment is vertical to the axis of the antiferromagnetism ("transversal" weak ferromagnetism). If the resulting moment of the spontaneous magnetization of the crystal is parallel to the axis of the antiferromagnetism, one speaks of "longitudinal" weak ferromagnetism (Ref 1).

Card 1/3

On the Theory of Weak Ferromagnetism

SOV/56-36-4-42/70

By using Landau's theory of phase transitions and a far more general expression for magnetic energy than in the paper of reference 1, Dzyaloshinskiy investigated the behaviour of weak ferromagnetics in dependence on temperature and the magnetic field near Curie temperature. The author of the present paper with the aid of Dzyaloshinskiy's theory investigates the same, but in the range of low temperatures by means of spin wave approximation. The cases of transversal and longitudinal weak ferromagnetism are dealt with. Expressions are derived for the spin wave energy, the temperature dependence of the magnetization, and the spin part of the thermal capacity. The temperature-dependent part of magnetization changes its sign at $H = \delta H_E/4$.

For the energy of the spin waves a linear dispersion law holds; $E_k = Ik$ (for $\varkappa T \gg \Delta E_0$, ΔE_0 - spin wave excitation energy). The author finally thanks S. V. Vonsovskiy for advice and discussions. There are 6 Soviet references.

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute for Metal Physics of the Academy of Sciences, USSR)

Card 2/3

TUROV, Ye.A.; IRKHIN, Yu.P.

Phenomenological theory of the electric conductivity of ferrates and antiferromagnetic materials. Fiz. met. i metalloved. 9 no. 4:488-497 Ap '61. (MIRA 14:5)

1. Institut fiziki metallov AN SSSR.
(Ferromagnetism) (Electric conductivity)

S/058/61/000/010/[illegible]
A001/A101

AUTHORS: Guseynov, N.G., Turov, Ye.A.

TITLE: On peculiarities of magnetic properties of some compounds of manga-nese with elements of nitrogen subgroup

PERIODICAL: Referativnyy zhurnal. Fizika, no. 10, 1961, 276-277, abstract 10[illegible] ("Izv. AN AzerbSSR. Ser. fiz.-matem. i tekhn. n.", 1960, no. [illegible] 96, Azerb. summary)

TEXT: The authors analyze in detail experimental data on magnetic prope[illegible] ties of compounds having the formula MnX (where X stands for Bi, Sb, As, [illegible] this basis and on symmetry considerations, they advance a hypothesis that spon[illegible] taneous magnetization (M_s) in MnP is related to non-collinear arrangement of [illegible] netic moments of sublattices (weak ferromagnetism). The calculations presen[illegible] show that the MnP structure (rhombically distorted NiAs structure, space grou[illegible] D_{2h}^{9}) admits of existence of weak ferromagnetism in plane (001); the deviati[illegible] magnetism of sublattices from the preferential axis of antiferromagnetism [illegible] angle $\sim 17°.5$ assures the M_s magnitude observed in experiments. A number of [illegible] retical conclusions follow from the hypothesis made, permitting its experi[illegible]

Card 1/2

S/058/61/000/010/086/100
A001/A101

On peculiarities of magnetic properties ...

verification; magnetic moments of Mn ions lie in plane (001) deviating from the [100] or [010] through the angle $\sim 17^{\circ}.5$; susceptibility of the para-process is great at low temperatures down to 0°K; magnetic properties possess a pronounced anisotropy; temperature dependence of M_s obeys the "T^2-law", etc.

V. Naysh

[Abstracter's note: Complete translation]

Card 2/2

05090

S/056/60/038/006/033/049/XX
B006/B070

24.7900 (1035,1144,1160)

AUTHORS: Turov, Ye. A., Mitsek, A. I.

TITLE: Temperature Dependence of Magnetostriction

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 6, pp. 1847-1851

TEXT: A study is made of the temperature dependence of linear (anisotropic) and volume (isotropic) magnetostriction at low temperatures by using the phenomenological method of spin-wave theory. The present work is a continuation of Ref. 1 where the temperature dependence of the ferromagnetic anisotropy constant was investigated by the same authors on the basis of the phenomenological spin-wave theory. The results obtained there are used now to determine the temperature dependence of the constant of anisotropic magnetostriction. The theoretical considerations are based on a general formulation for the density of magnetoelastic energy of a ferromagnetic. In the first approximation, this formulation has the following form:

Card 1/3

85690

Temperature Dependence of Magnetostriction

S/056/60/038/006/033/049/XX
B006/B070

$$\mathcal{H}_{me} = -\lambda_{ls;n_1n_2n_3}\sigma_{ls} m_x^{n_1} m_y^{n_2} m_z^{n_3} - G_{ijls}\sigma_{ls}\frac{\partial m_t}{\partial r_i}\frac{\partial m_t}{\partial r_j}$$

, where $m_t(\vec{r}) = M_t(\vec{r})/M_0$ are the components of the unit vector of the local magnetization; M_0 - absolute saturation; $i,j,l,s,t \equiv x,y,z$; n_1, n_2, n_3 - whole numbers; $n_1+n_2+n_3 = 2N$ (an even number); summation is to be made over repeated subscripts. The first term gives the anisotropic part of magnetoelastic energy in the form of an expansion in a power series of the magnetization components; the second term gives the change in volume energy of the ferromagnetic, where $G_{ijls} = -\partial A_{ij}/\partial \sigma_{ls}$; A_{ij} are the volume exchange parameters. The explicit forms of the parameters λ and G are determined by the crystal symmetry. The components of the elastic stress tensor σ_{is} can be considered parameters for the present problem; they are related to the equilibrium deformations through the elastic

Card 2/3

85690

Temperature Dependence of Magnetostriction S/056/60/038/006/033/049/XX
B006/B070

moduli, the thermal lattice vibrations not being considered. Harmonic elastic lattice vibrations do not alter the equilibrium deformations of the crystal, and so do not affect the average magnetoelastic energy of the ferromagnetic. Anharmonic oscillations lead to thermal expansion, and can be added to the correction for temperature change of the magnetostriction deformations in first approximation. Thus, the temperature dependence of magnetostriction deformations is largely determined by the thermal vibrations of magnetization, that is, by spin waves. Thus, the problem set here can be reduced to a calculation of the energy spectrum of spin waves. It differs from the previous paper only in that the magnetoelastic energy is taken into consideration. S. V. Vonsovskiy is thanked for discussions and advice. There are 9 Soviet references.

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of Metal Physics of the Academy of Sciences USSR)

SUBMITTED: January 9. 1960

Card 3/3

83744

S/056/60/038/004/037/048
B006/B056

9.4300 (1035,1138,1143)
24.7900

AUTHORS: Turov, Ye. A., Guseynov, N. G.

TITLE: Magnetic Resonance in Rhombohedral Weak Ferromagnetics

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, 1960, Vol. 38, No. 4, pp. 1326 - 1331

TEXT: The authors use the conceptions of the nature of weak ferromagnetism explained by I. Ye. Dzyaloshinskiy in Ref. 1 and the Hamiltonian given by him for investigating the conditions for magnetic resonance in weak ferromagnetics. As examples, the authors deal with weakly ferromagnetic rhombohedral crystals of the types of α-Fe_2O_3 and $MnCO_3$, because it is on these that the most experimental data are available. In the present paper it is shown that by using Dzyaloshinskiy's conceptions of weak ferromagnetism, a far more natural explanation of the observed resonance properties of hematite can be given than that which, e.g., Kumagai et al. (who carried out a very complete experimental investigation of resonance on hematite), Shimizu and others succeeded in giving.

Card 1/2

83744

Magnetic Resonance in Rhombohedral Weak Ferromagnetics

S/056/60/038/004/037/048
B006/B056

The theoretical results obtained are used for discussing the resonance properties of hematite; the theoretical and experimental results are compared, and very good agreement is found. The theoretically obtained dependence of $1/\lambda = \omega_1/2\pi c$ on the resonance field strength H lying in the direction of the lightest magnetization axis is shown in the Fig. on p. 1330. For comparison, the experimental data taken from Ref. 3 are given. The measured values are on the theoretical curve, with the exception of one value at $H \lesssim 2000$ oe, but in this case the condition of saturation magnetization is no longer satisfied. The authors thank S. V. Vonsovskiy for discussing the results obtained. A. S. Borovik-Romanov, L. D. Landau, Ye. M. Lifshits, M. I. Kaganov, V. M. Tsukernik, and Yu. M. Seidov are mentioned. There are 1 figure and 16 references: 8 Soviet, 5 US, 2 French, and 1 Japanese.

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of Physics of Metals of the Academy of Sciences USSR)

SUBMITTED: November 23, 1959

Card 2/2

S/126/60/009/04/002/033
E032/E435

AUTHORS: Turov, Ye.A. and Irkhin, Yu.P.

TITLE: On the Phenomenological Theory of Electrical Conductivity of Ferrites and Antiferromagnetics

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol 9, Nr 4, pp 488-497 (USSR)

ABSTRACT: General symmetry and invariance properties are used in a discussion of the energy spectrum of current carriers in ferromagnetics and antiferromagnetics with particular reference to the magnetic structure in these materials. The change in the energy spectrum of current carriers which takes place during a transition through the Curie point may lead to an "anomaly" in the temperature dependence of the electrical resistance. These anomalies are investigated in the present paper and the theoretical results obtained are compared with experiment. A new type of anomaly in the electrical resistance of ferrites is predicted. According to this prediction, at a certain temperature T_0 the compensation of exchange forces, acting on the spin of a current quasi-particle, is compensated by the magnetization of different magnetic

Card 1/2

S/126/60/009/04/002/033
E032/E435

On the Phenomenological Theory of Electrical Conductivity of Ferrites and Antiferromagnetics

sublattices. The theoretical method employed in this discussion was developed by Turov et al (Ref 13) in connection with ferromagnetic metals. The paper begins with a general discussion of the energy spectrum which is then specialized to a ferromagnetic with a single sublattice, and to the case of two sublattices, including antiferromagnetic semiconductors and ferrites. In the latter case, the abovementioned anomaly in the electrical conductivity occurs as illustrated in Fig 2. In each case formulae are derived for the electrical resistivity as a function of the lattice parameters and the temperature. There are 2 figures and 17 references, 14 of which are Soviet and 3 English. Acknowledgments are made to S.V.Vonsovskiy for advice and discussions.

ASSOCIATION: Institut fiziki metallov AN SSSR (Institute of Physics of Metals AS USSR)

SUBMITTED: August 3, 1959

Card 2/2

S/126/60/010/006/001/022
E032/E414

9.4300 (3203, 1043, 1137, 1035)

AUTHORS: Abel'skiy, Sh.Sh. and Turov, Ye.A.

TITLE: On the Theory of the Temperature Dependence of Electrical and Thermal Conductivity of Ferromagnetics at Low Temperatures

PERIODICAL: Fizika metallov i metallovedeniye, 1960, Vol.10, No.6, pp.801-806

TEXT: The scattering of conduction electrons on spin waves ("ferromagnons") is a contributing factor to the electrical and thermal conductivity of ferromagnetic metals. Owing to its specific temperature dependence, this part of the conductivity may, under certain conditions, exceed the conductivity associated with scattering on phonons. This problem was considered by the second of the present authors in Ref.3, where it was shown that the temperature dependence of the ferromagnon part of electrical resistivity ρ_T can be written down in the form of two terms, namely:

$$\rho_T = a_1 T + a_2 T^2 \qquad (1)$$

Card 1/7

S/126/60/010/006/001/022
E032/E414

On the Theory of the Temperature Dependence of Electrical and Thermal Conductivity of Ferromagnetics at Low Temperatures

where a_1 and a_2 are constants independent of the temperature T. The first term in Eq.(1) takes into account electromagnetic interactions between conduction electrons and the magnetic field produced by spin waves ("spin-orbit interaction"); the second term is due to exchange interaction between conduction electrons and electrons responsible for the ferromagnetism (the "s-d exchange interaction"). Experimental studies of the temperature dependence of ρ_T have shown that Eq.(1) is in qualitative agreement with the experimental data for ferromagnetic metals at helium temperature. However, further development of the theory (Ref.5) has shown that the linear term in Eq.(1), i.e. the term due to the spin-orbit interaction, is lower than the experimental result by two or three orders of magnitude. In the present paper, the temperature dependence of ρ_T is re-examined in detail, with special reference to the s-d exchange interaction effects. The dispersion relation for the conduction electrons is

Card 2/7

S/126/60/010/006/001/022
E032/E414

On the Theory of the Temperature Dependence of Electrical and Thermal Conductivity of Ferromagnetics at Low Temperatures

taken in the form

$$E_{k\sigma} = E(k) + 2\sigma I(k) \qquad (4)$$

where $E(k)$ and $I(k)$ are arbitrary functions of the modulus of the quasi-momentum $\vec{k}$ and $\sigma = \pm 1/2$ (spin quantum number of the electron). In addition, the part of the thermal resistivity of the ferromagnetic metal which is due to the scattering of conduction electrons by spin waves is also computed. The electrical resistivity is calculated using the method developed by Kubo in Ref.11 and applied to the calculation of resistivities by Nakano (Ref.12). In this way, it is shown that the electrical resistivity is given by

Eq.(9)
p.803

$$\rho_T = c_1\left(T_0 \ln\frac{e^{T_0/T}+1}{e^{T_0/T}-1}\right)T + c_2\left(\int\limits_{T_0/T}^{\infty}\frac{y e^y\,dy}{e^{2y}-1}\right)T^2. \qquad (9)$$

Card 3/7

S/126/60/010/006/001/022
E032/E414

On the Theory of the Temperature Dependence of Electrical and Thermal Conductivity of Ferromagnetics at Low Temperatures

This formula includes three parameters, namely T_o, c_1 and c_2. T_o is the critical temperature below which exchange effects can be neglected; c_1 and c_2 can be obtained from the dispersion relation given by Eq.(4). When $T \gg T_o$, Eq.(9) reduces to

$$\rho_T = c_1 (T_o \ln \frac{2T}{T_o}) T - \frac{1}{2} c_2 T_o T + \frac{\pi^2}{8} c_2 T^2 \qquad (11)$$

whilst for $T \ll T_o$, $\rho_T \sim \exp(-T/T_o)$. When T is of the order of T_o, the general formula given by Eq.(9) must be employed. In order to explain the experimental data reported by Kondorskiy et al (Ref.6) and Sudovtsev et al (Ref.7), who found that in addition to the quadratic term a linear term was also present, it is necessary to assume that the coefficient c_1 is large. This, in turn, indicates that the energy spectrum of the conduction electrons cannot be described in these particular cases on the basis of a quadratic dispersion law. The paper is concluded by a

Card 4/7

S/126/60/010/C06/001/022
E032/E414

On the Theory of the Temperature Dependence of Electrical and Thermal Conductivity of Ferromagnetics at Low Temperatures

calculation of the thermal resistivity. It is shown that the thermal resistivity W is given by the approximate formula:

$$W \approx \frac{e^2 \Theta_c (ak_0)^2 c_2}{\varkappa^2} \qquad (14)$$

Thus, W is independent of temperature, in agreement with the work of Kasuya (Ref.15). Moreover, the actual magnitude of the thermal resistivity depends on the same coefficient c_2 which determines the quadratic term in the electrical resistivity. When c_2 is determined from experimental data on electrical resistivity (Ref.7), then it is found that W lies between 10^{-6} and 10^{-7} deg cm sec/erg. This is in agreement (to within an order of magnitude) with the value obtained by Rosenberg (Ref.16) for iron in the helium temperature region. Rosenberg's work shows that the thermal resistivity of many metals can be represented by the formula

Card 5/7

S/126/60/010/006/001/022
E032/E414

On the Theory of the Temperature Dependence of Electrical and Thermal Conductivity of Ferromagnetics at Low Temperatures

$$W = \alpha_1 T^2 + \alpha_2/T \qquad (15)$$

in which the first term is expressed by the scattering of electrons by phonons and the second by scattering on impurities. At low temperatures, the second term predominates. According to the present theory, Eq.(15) must be supplemented by the further term given by Eq.(14). It is expected that for sufficiently pure specimens this component will be comparable with that due to the scattering of electrons on impurities. It follows that the thermal resistivity due to scattering of electrons on spin waves may be detected in very pure specimens of ferromagnetic metals at sufficiently low temperatures. Acknowledgments are expressed to Yu.A.Isyumov and S.V.Vonsovskiy for valuable advice. There are 16 references: 12 Soviet and 4 non-Soviet.

Card 6/7

S/126/60/010/006/001/022
E032/E414

On the Theory of the Temperature Dependence of Electrical and Thermal Conductivity of Ferromagnetics at Low Temperatures

ASSOCIATIONS: Ural'skiy gosudarstvennyy Universitet im. A.M.Gor'kogo (Ural State University imeni A.M.Gor'kiy)
Institut fiziki metallov AN SSSR (Institute of Physics of Metals AS USSR)

SUBMITTED: June 26, 1960

Card 7/7

TUROV, YE. A.

PHASE I BOOK EXPLOITATION SOV/4893

Vsesoyuznoye soveshchaniye po fizike, fiziko-khimicheskim svoystvam ferritov i fizicheskim osnovam ikh primeneniya. 3d, Minsk, 1959

Ferrity; fizicheskiye i fiziko-khimicheskiye svoystva. Doklady (Ferrites; Physical and Physicochemical Properties. Reports) Minsk, Izd-vo AN BSSR, 1960. 655 p. Errata slip inserted. 4,000 copies printed.

Sponsoring Agencies: Nauchnyy sovet po magnetizmu AN SSSR. Otdel fiziki tverdogo tela i poluprovodnikov AN BSSR.

Editorial Board: Resp. Ed.: N. N. Sirota, Academician of the Academy of Sciences BSSR; K. P. Belov, Professor; Ye. I. Kondorskiy, Professor; K. M. Polivanov, Professor; R. V. Telesnin, Professor; G. A. Smolenskiy, Professor; N. N. Shol'ts, Candidate of Physical and Mathematical Sciences; E. M. Smolyarenko; and L. A. Bashkirov; Ed. of Publishing House: S. Kholyavskiy; Tech. Ed.: I. Volokhanovich.

~~Card 1/18~~

Ferrites (Cont.) SOV/4893

PURPOSE: This book is intended for physicists, physical chemists, radio electronics engineers, and technical personnel engaged in the production and use of ferromagnetic materials. It may also be used by students in advanced courses in radio electronics, physics, and physical chemistry.

COVERAGE: The book contains reports presented at the Third All-Union Conference on Ferrites held in Minsk, Belorussian SSR. The reports deal with magnetic transformations, electrical and galvanomagnetic properties of ferrites, studies of the growth of ferrite single crystals, problems in the chemical and physicochemical analysis of ferrites, studies of ferrites having rectangular hysteresis loops and multicomponent ferrite systems exhibiting spontaneous rectangularity, problems in magnetic attraction, highly coercive ferrites, magnetic spectroscopy, ferromagnetic resonance, magneto-optics, physical principles of using ferrite components in electrical circuits, anisotropy of electrical and magnetic properties, etc. The Committee on Magnetism, AS USSR (S. V. Vonsovskiy, Chairman) organized the conference. References accompany individual articles.

Card 2/18

TABLE OF CONTENTS:

GUSEYNOV, N.G.; TUROV, Ye.A.

Characteristics of the magnetic properties of some manganese compounds with elements of the nitrogen subgroup. Izv. AN Azerb. SSR. Ser.fiz.-mat. i tekh. nauk no.4:85-9 '60. (MIRA 14:3)
(Manganese compounds--Magnetic properties)

S/081/61/000/019/001/085
B101/B110

AUTHORS: Guseynov, N. G., Turov, Ye. A.

TITLE: The problem of peculiarities of the magnetic properties of some compounds of manganese with elements of the nitrogen subgroup

PERIODICAL: Referativnyy zhurnal. Khimiya, no. 19, 1961, 20, abstract 19B141 (Izv. AN AzerbSSR. Ser. fiz.-matem. i tekhn. n., no. 4, 1960, 85-96)

TEXT: From an analysis of experimental data on the crystal structure and magnetic properties of the compounds MnX, where X = P (I), As (II), Sb (III), and Bi (IV), it is concluded that I-IV belong to the class of ferromagnetics, and not to that of ferrimagnetics. The spontaneous magnetization intensity of I is probably due to the non-collinear (i.e., non-parallel or anti-parallel) arrangement of magnetic moments of the sublattices of this compound. It is assumed that the non-collinearity of magnetic moments at low temperatures results in strong susceptibility and in a pronounced

Card 1/2

The problem of peculiarities of the... S/081/61/000/019/001/085 B101/B110

anisotropic character of the magnetic properties of the single crystal of I. In addition, the temperature dependence of the spontaneous magnetization intensity is assumed to obey the "T^2 law", and not the "$T^{3/2}$ law" as in the case of ordinary ferromagnetics. It is further believed that the magnetic resonance absorption also has a very peculiar nature and that the magnetic moments of Mn ions are located in the (001) plane below the Curie point and deviate from the [100] or [010] axis by an angle of approximately 17.5°. [Abstracter's note: Complete translation.]

Card 2/2

NAYSH, V.Ye.; TUROV, Ye.A.

Theory of noncollinear ferromagnetism and antiferromagnetism in rhombic crystals. Part I. Fiz. met. i metalloved. 11 no. 2:161-169 F '61. (MIRA 14:5)

1. Institut fiziki metallov AN SSSR.
(Ferromagnetism) (Crystal lattices)

30057
S/048/61/025/011/001/031
B108/B138

15.2660 1144

AUTHOR: Turov, Ye. A.

TITLE: Non-collinear ferro- and antiferromagnetism

PERIODICAL: Akademiya nauk SSSR. Izvestiya. Seriya fizicheskaya, v. 25, no. 11, 1961, 1315-1320

TEXT: This paper was read at the Conference on ferromagnetism and antiferromagnetism in Leningrad, May 5-11, 1961. Some conditions leading to weak ferromagnetism are considered. A system of spins which are at equivalent lattice sites may be described by means of two magnetic sublattices provided its configuration is collinear or only slightly non-collinear. The parity of a collinear antiferromagnetic structure is even or odd, according to whether the spins of only one or of both sublattices are reversed when a symmetric operation is applied. Consequently, the vector $\vec{l} = (S_1 - S_2)/2S_0$ of antiferromagnetism conserves or changes its sign. The vector $\vec{m} = (S_1 + S_2)/2S_0$ of ferromagnetism is invariant to any spin reversal and varies as an ordinary axial vector. Weak ferromagnetism may

Card 1/2

30057

Non-collinear ferro- and... S/048/61/025/011/001/031
B108/B138

arise only in structures that are even with respect to all lattice translations and to the symmetry center. The chemical and magnetic elementary cells must coincide. Various invariants in the spin Hamiltonian are given in the Table. These data are evaluated for some concrete crystallographic structures. Weak ferromagnetism is chiefly due to the fact that the magnetic sublattices are not completely equivalent. This may be caused by the different temperature dependences of the mean thermodynamic spin moments of the two sublattices. Moreover, the effective magnetomechanical ratio (g factor) of the sublattices may be different, which causes a longitudinal spontaneous magnetic moment. Since the vectors $\vec{m}$ and $\vec{l}$ are perpendicular to each other, the above statements hold true for transverse as well as for longitudinal weak ferromagnetism. Mention is made of A. S. Borovik-Romanov and N. M. Kreynes (Zh. eksperim. i. teor. fiz., 33, 1119 (1957); 40, 762 (1961)). There are 1 table and 12 references: 10 Soviet and 2 non-Soviet. The two references to English-language publications read as follows: Moriya T., Phys. Rev., 117, 635 (1960); ibid., 120, 91 (1960); Henstan, Brockhause, Bull. Amer. Phys. Soc., 2, 9 (1957).

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of Physics of Metals of the Academy of Sciences USSR)

Card 2/~~3~~2

NAYSH, V. Ye.; TUROV, Ye.A.

Theory of noncollinear ferromagnetism and antiferromagnetism in rhombic crystals. Fiz. met. i metalloved. 11 no.3:321-330 Mr '61. (MIRA 14:3)

1. Institut fiziki metallov AN SSSR.
(Metal crystals) (Ferromagnetism)

38864

S/056/62/042/006/025/047
B104/B102

24.2200

AUTHOR: Turov, Ye. A.

TITLE: The conditions for existence of weak ferromagnetism and classification of slightly ferromagnetic structures

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 6, 1962, 1582-1589

TEXT: In a previous paper (Ye. A. Turov, C. R. Paris, 252, 3420, 1961; Izv. AN SSSR, seriya fiz., 25, 1315, 1961) some conditions necessary for the existence of a slight ferromagnetism in antiferromagnetic crystals were stated. In the present paper the conditions not only necessary but also sufficient for the existence of weak ferromagnetism in slightly non-colinear and colinear antiferromagnetic structures are developed. Starting from invariants of magnetic energy, a complete classification of structure types permitting slight ferromagnetism is worked out, juxtaposing descriptions of this effect in every structure type. An appendix gives gyromagnetic tensors of all slightly ferromagnetic structures. There is 1 table.

Card 1/2

The conditions for...

S/056/62/042/006/025/047
B104/B102

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of Physics of Metals of the Academy of Sciences USSR)

SUBMITTED: December 27, 1961

Card 2/2

37894

24.2200

S/056/62/042/005/045/050
B108/B138

AUTHOR: Turov, Ye. A.

TITLE: Longitudinal magnetization of antiferromagnetics by a transverse, circularly polarized magnetic field

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 42, no. 5, 1962, 1415-1416

TEXT: The magnitude of the longitudinal magnetization was estimated for an antiferromagnetic in a transverse, circularly polarized h. f. magnetic field. In first (linear) approximation it is

$$M^{+}_{1,2} = \frac{\gamma M_0 (\omega \pm \gamma H_A) h_0}{\omega_0^2 - \omega^2} e^{i\omega t}, \quad M^{-}_{1,2} = \frac{\gamma M_0 (\omega \pm \gamma H\ ) h_0}{\omega_0^2 - \omega^2} e^{-i\omega t}, \qquad (2).$$

$$M_{1z} \cong -M_{2z} \cong M_0,$$

$\omega_0 = \gamma\sqrt{H_E H_A}$ is the resonant frequency, H_E is the "exchange" field, H_A is the field of magnetic anisotropy. In second (nonlinear) approximation the

Card 1/2

Longitudinal magnetization of ... S/056/62/042/005/045/050
B108/B138

Longitudinal magnetization is $M_z = M_{1z} + M_{2z}$ with $M_{1z} \cong M_o - M_1^+ M_1^- / 2M_o$ and $M_{2z} \cong -M_o + M_2^+ M_2^- / 2M_o$. In the case of resonance ($\omega = \omega_o$) it is $M_z / M_o = -2(\gamma H_A / \omega_o)(h_o / \Delta H)^2$ or $-2(H_A / H_E)^{1/2} (h_o / \Delta H)^2$, where $\Delta H = \Delta\omega / \gamma$ is the width of the resonance line. h_o is the h. f. field amplitude. The crystals used to observe this effect should have quite a narrow resonance line. It is pointed out that this effect should also exist with nuclear magnetic resonance in antiferromagnetics.

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of Physics of Metals of the Academy of Sciences USSR)

SUBMITTED: March 10, 1962

Card 2/2

TUROV, Ye.A.

Noncollinear ferromagnetism and antiferromagnetism. Izv. AN SSSR. Ser. fiz. 25 no.11:1315-1320 N '61. (MIRA 14:11)

1. Institut fiziki metallov AN SSSR.
(Ferromagnetism)

APPROVED FOR RELEASE: 04/03/2001 CIA-RDP86-00513R001757610002-2"

44242

S/056/62/043/006/051/067
B102/B186

24.7600

AUTHORS: Turov, Ye. A., Shavrov, V. G.

TITLE: Galvano- and thermomagnetic effects in antiferromagnetics

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 43, no. 6(12), 1962, 2273-2276

TEXT: The static effects related to the existence of a separate axis of antiferromagnetic ordering in certain crystals (cf. e.g. ZhETF, 42, 1582, 1962; 33, 807, 1957; 36, 1954, 1959) have been investigated already. Here the kinetic effects, namely galvanic and thermomagnetic, are studied in a general phenomenological manner. Antiferromagnetic crystals with various crystallographic and magnetic structures are considered, the variety of the latter being restricted by the assumption that collinear or weakly non-collinear structures are describable by two sublattices with the magnetizations $\vec{M}_{1,2}$, where $\vec{L} = \vec{M}_1 - \vec{M}_2$ is the axis of antiferromagnetic ordering. Between forces and fluxes the relation $F_\alpha = \varrho_{\alpha\beta}(\vec{H},\vec{M},\vec{L})j_\beta$ must hold; in the case of galvanomagnetic effects $\vec{F}$ will be the electric field strength and $\vec{j}$ the

Card 1/4

S/056/62/043/006/051/067
B102/B186

Galvano- and thermomagnetic...

current density. First the spontaneous Hall effect is considered for a 2^+2^- rhombohedral lattice structure. The spontaneous transverse galvano-magnetic effect

$$F_x^{(s)} = -R_1^s j_z L_x, \quad F_y^{(s)} = -R_2^s j_z L_y, \quad F_z^{(s)} = R_1^s j_x L_x + R_2^s j_y L_y. \qquad (5)$$

For a structure of the type $3_z^+ 2_x^-$

$$F_x = R_1 j_y H_z - R_2 j_z H_y, \quad F_y = R_2 j_z H_x - R_1 j_x H_z, \quad F_z = R_3 (j_x H_y - j_y H\ ). \qquad (6)$$

and for $\vec{L} \parallel \vec{z}$ (e.g. in hematite below 250°K or $FeCO_3$ below 35°K),

$$\begin{aligned} F_x &= \alpha_1 L (j_x H_x - j_y H_y) + \alpha_3 L j_z H_y, \\ F_y &= -\alpha_1 L (j_x H_y + j_y H_x) - \alpha_3 L j_z H_x, \qquad (7) \\ F_z &= \alpha_3 L (j_x H_y - j_y H_x). \end{aligned}$$

Card 2/4

The terms with α_1 of (7) describe completely new effects. If in this case $\vec{j}$ and $\vec{H}$, and therefore also $\vec{F}$, lie in the basal plane,

$$F_\parallel = \alpha_1 LjH \cos(3\varphi_j + \varphi_{jH}), \quad F_\perp = -\alpha_1 LjH \sin(3\varphi_j + \varphi_{jH}). \qquad (8)$$

If $\vec{L} \perp \vec{z}$ (in α-Fe_2O_3 at $250^\circ < T < 950^\circ K$, or in $MnCO_3$ and CrF_3) besides the above mentioned spontaneous transverse effect, new effects, linear in $\vec{L}$ and $\vec{H}$ may arise. If in this case $\vec{j} \parallel \vec{z}$, $\vec{H} \perp \vec{z}$ and $\vec{H} \perp \vec{L}$,

$$F_\parallel = \alpha_3 LjH, \quad F_\perp = \alpha_4 LjH \sin(3\varphi_F + 2\varphi_{FH}), \qquad (9)$$

where φ_F is the angle determining the direction of change of the field $\vec{F}$ that is perpendicular to the current, φ_{FH} is the angle between $\vec{F}$ and $\vec{H}$. Conclusions: The effects that are odd with respect to $\vec{H}$ are only so when a change in sign of $\vec{H}$ is not accompanied by a rotation of $\vec{L}$. These effects

make it possible to discern antiferromagnetic states with different directions of $\vec{L}$. The presence of a domain structure with oppositely directed $\vec{L}$'s enables the effects linear in $\vec{L}$ to compensate each other. Therefore one can conclude from the presence of these effects whether in uniaxial antiferromagnetics with $\vec{L} \parallel \vec{z}$ 180° domain boundaries exist or not.

ASSOCIATION: Institut fiziki metallov Akademii nauk SSSR (Institute of the Physics of Metals of the Academy of Sciences USSR)

SUBMITTED: July 9, 1962

TUROV, Ye.A.

Conditions for the existence of weak ferromagentism and the classification of weakly ferromagnetic structures. Zhur. eksp. i teor. fiz. 42 no.6:1582-1589 Je '62. (MIRA 15:9)

1. Institut fiziki metallov AN SSSR.
(Ferromagnetism)

TUROV, Ye.A.

Effect of longitudinal magnetizing of an antiferromagnetic by a transverse circularly polarized magnetic field. Zhur. eksp. i teor. fiz. 42 no.5:1415-1416 My '62. (MIRA 15:9)

1. Institut fiziki metallov AN SSSR.
(Magnetization) (Magnetic fields)